Steering and Influence in Transnational Climate Governance: Nonstate Engagement in Solar Geoengineering Research

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Abstract

Theorists of transnational climate governance (TCG) seek to account for the increasing involvement of nonstate and substate actors in global climate policy. While transnational actors have been present in the emerging field of solar geoengineering—a novel technology intended to reflect a fraction of sunlight back to space to reduce climate impacts—many of their most significant activities, including knowledge dissemination, scientific capacity building, and conventional lobbying, are not captured by the TCG framework. Insofar as TCG is identified with transnational governance and transnational governance is important to reducing climate risks, an incomplete TCG framework is problematic for effective policy making. We attribute this shortcoming on the part of TCG to its exclusive focus on steering and corollary exclusion of influence as a critical component of governance. Exercising influence, for example, through inside and outside lobbying, is an important part of transnational governance—it complements direct governing with indirect efforts to inform, persuade, pressure, or otherwise influence both governor and governed. Based on an empirical analysis of solar geoengineering research governance and a theoretical consideration of alternative literatures, including research on interest groups and nonstate advocacy, we call for a broader theory of transnational governance that integrates steering and influence in a way that accounts for the full array of nonstate and substate engagements beyond the state.

By all accounts, transnational actors[1] have come to play an important role in global governance.[2] For some, transnational engagement represents a "new

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1. We define *transnational* as activity not involving the central state apparatus that extends beyond national boundaries. There are two types of transnational actors. *Nonstate actors* are those not legally constituted as governmental. *Substate actors* are governmental entities that operate below the level of the central government or quasi-independently from the central state. *Transnational actors* thus are nonstate and substate actors operating beyond national boundaries.
2. We define *governance* broadly as the sum of activities involved in managing society. *Global governance* is the sum of activities involved in managing global society. *Transnational governance* is that portion of global governance undertaken by transnational actors.

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mode of governance" compared to the "old mode of governance" practiced by states and state-based institutions (Bäckstrand 2008). Within global climate politics, the leading conceptual apparatus for seeking to understand the activities and effects of transnational actors is the transnational climate governance (TCG) research program (Andonova et al. 2018).

Over the past decade, TCG theorists have elaborated a shared analytical framework first introduced by Andonova et al. (2009) and subsequently revised by multiple scholars—we refer to this as the TCG framework. This framework stipulates that transnational governance involves "three common features": "governance is concerned with *realising public goals* through the process of *steering a particular constituency of actors* and is *regarded as authoritative*" (Bulkeley et al. 2012, 594, emphasis original). Furthermore, "'steering' means that an initiative aims to somehow change or coordinate the actions of those who participate through the setting of rules, standards, or other kinds of guidelines that aim to regulate the behavior of individuals or corporate bodies or the characteristics of goods or services they produce" (Roger et al. 2017, 5–6). A recent review of transnational governance as encapsulated by the TCG framework concludes that it "is not simply a peripheral phenomenon; it is one that now reliably rises up to fill some of the gaps left behind by failed or inadequate interstate cooperation. If it is still not the 'rule' in most domains of world politics, it is the main game in many" (Roger and Dauvergne 2016, 432).

Over this same period, other scholars have turned their focus to the policy implications of solar geoengineering, an emerging technology intended to reflect a small fraction of incoming sunlight back to space to lower global temperatures and partially compensate for the effects of climate change. The study of solar geoengineering governance is growing rapidly. For the most part, states and intergovernmental institutions thus far have opted not to engage in substantive policy discussions or governance initiatives regarding this potentially important global issue. The absence of state involvement has effectively cleared the field for transnational actors who, for all intents and purposes, have had the politics of solar geoengineering to themselves.

It would be reasonable to expect that the TCG framework could contribute to understanding the nature of transnational activity in this emerging area of climate policy. And yet, as we will show, TCG is limited in its ability to shed light on nonstate engagements in solar geoengineering. In particular, TCG overlooks or excludes a number of important activities already occurring. These include knowledge dissemination, scientific capacity building, and inside and outside lobbying.

The reason for this, we will argue, is that TCG equates the act of governing with the condition of governance. Governing, or steering, entails a *direct* connection between governor and governed. Governing is clearly the principal component of governance, but just as clearly, there is more to governance than governing. Governance also involves influencing, or *indirect* efforts to affect the relationship between governor and governed. Influencing may target either

party to a steering relationship; it includes but is not limited to knowledge dissemination, capacity building, and lobbying. Without incorporating activities aimed at shaping the steering relationship, any theory that seeks to understand and explain transnational governance will necessarily be incomplete. In the same way that global governance is both intergovernmental and transnational, transnational governance consists of both steering and influencing.

To the extent that TCG is identified with the spectrum of transnational governance activities in the climate field, and to the extent that transnational governance helps reduce climate risks, the exclusion by TCG of a range of indirect but valuable transnational actor contributions from theoretical consideration poses a risk to successful climate policy making. For example, the Climate Initiatives Platform, run by the United Nations Environment Programme (UNEP), defines "international cooperative initiatives" (ICIs) in reference to the TCG framework (United Nations Environment Programme 2018a). UNEP in turn discusses ICIs in its annual emission gaps reports and funnels data on ICIs to the UN Framework Convention on Climate Change (UNFCCC) Global Climate Action portal, which tracks cooperative (transnational) initiatives under the convention. In other words, decision makers' view of transnational climate governance is mediated by the TCG framework.

Fortunately, the task of incorporating influencing via knowledge dissemination, capacity building, and lobbying into a broader conception of governance that goes beyond simple transmission from governor to governed benefits from a large reservoir of applicable social theory, including interest group theory, nongovernmental organization (NGO) theory, and research on epistemic communities. Conceptual models such as expert networks and inside and outside lobbying account for transnational influence in a way that complements the TCG focus on transnational steering. An integrated theory of transnational governance could explain a broader array of nonstate and substate behaviors and related outcomes compared to TCG in its present form. Such a theory would advance collective understanding of "new" modes of transnational governance while acknowledging the enduring importance of "old" modes.

The purpose of this article is to highlight the neglect of transnational influence by TCG, consider the implications, and promote a broader theory of transnational governance that complements a focus on steering with attention to more conventional forms of nonstate influence like lobbying. We use solar geoengineering research governance as a case study to demonstrate these shortcomings. In what follows, we first provide relevant backgrounds on the TCG framework and solar geoengineering. We then explore the existing empirical landscape with respect to transnational governance of solar geoengineering; reviewing significant transnational engagements allows us to demonstrate that knowledge dissemination, capacity building, and lobbying activities are systematically excluded from consideration by the framework as a result of its exclusive focus on steering. Next, we consider ways in which neglect of indirect influence on the part of the TCG framework has impacted scholarship on solar

geoengineering research governance. We then examine other literatures, in particular, the emerging synthesis of research on interest groups and NGO advocacy, with potential to fill in the TCG influence gap. We end with a brief conclusion.

The TCG Framework

What we call the TCG framework represents the accumulated theoretical insights of a community of scholars who have been working to describe, account for, and tease out the implications of the profusion of climate governance activities pursued by nonstate and substate actors across national borders. Nonstate actors include individuals and organizations that act independently of sovereign states and of state-based institutions like intergovernmental organizations and multilateral environmental agreements. Nonstate actors encompass both nonprofit members of civil society, such as NGOs and epistemic communities, and firms, multinational corporations, trade associations, and other business entities motivated by profit. Both civil society organizations and market participants are typically regarded as *private* actors insofar as they exist separately from the state. Substate actors, by contrast, are *public* in nature, yet they act quasi-independently from the central state (including the foreign policy apparatus). For example, municipal and other local governments and (subnational) state and provincial governments are all public bodies, yet they frequently pursue objectives decoupled from central government policy. When operating transnationally, nonstate and substate actors typically work together in the form of networks, coalitions, and other configurations.

Over the past decade, key features of the TCG framework have been developed in a number of scholarly articles and books. Earlier work (e.g., Andonova et al. 2009; Bulkeley et al. 2012; Abbott 2012; Green 2013) led to a series of refinements, modifications, and clarifications that recently resulted in a revised version serving as the basis for a special issue of *International Interactions* focused on the comparative politics of TCG (see Roger et al. 2017). Unfortunately, this current version of the TCG framework is not presented as a precise delineation of form, function, and process (as were some previous iterations, e.g., Andonova et al. 2009). Instead, it is presented in a way that relies on knowledge of and references to previous work in this vein. Hence, in what follows, we explicate the defining features of the framework as we understand them.

In order for an action to qualify as transnational governance, five criteria must be met. First, nonstate and/or substate actors must be involved. Second, these actors must be located in more than one state. Third, the relevant actors must seek to *steer* their targets; that is, an actor must attempt to control, regulate, channel, or otherwise direct the behavior of other parties (Andonova et al. 2009, 56). Steering is "purposive": governors must intend to govern the governed. Fourth, such steering must draw on authority rather than relying on intimidation or threats of violence (Andonova et al. 2009, 56). Such authority may be either public, as in the case of substate actors, or private, as with nonstate actors,

for whom authority may derive from moral standing, knowledge claims, market position, or some other source. Finally, the goals of governance must be public rather than private; that is, steering must be focused on achieving collective ends rather than obtaining personal satisfaction or private gain (Andonova et al. 2009, 56). Thus, private actors may be said to engage in governance to the extent that their aims invoke some version of the common good. Notably, an activity need not succeed in order to qualify as transnational governance: "To be considered a form of transnational governance, … networks must seek to address some form of public goal (though they may not accomplish it)" (Andonova et al. 2009, 56).

The TCG framework identifies four primary functions performed by transnational actors. First, rule-setting entails the creation and dissemination of standards, targets, and commitments (Andonova et al. 2009, 65). The rules in question are generally not legally binding but instead are considered forms of soft law or self-regulation (Bulkeley et al. 2012, 604) or "regulatory standard-setting" (Abbott 2012, 572). Second, "information and networking" are activities "designed to share knowledge and experiences and alleviate information asymmetries" (Roger et al. 2017, 6). Third, financing involves providing financial support (Abbott 2012, 580). Lastly, "operations" is essentially project implementation (Roger et al. 2017, 6). Crucially, these four functions only count as governance when their targets are not central governments or intergovernmental institutions; activities focused on states constitute influencing or lobbying (Andonova et al. 2009, 56). Only when the targeted entities are outside the interstate system—industries, manufacturers, consumers, community groups, citizenries, and so on—does steering equate with governance.

TCG theorists have sought to integrate the theory of "orchestration" within their shared framework. As originally devised by Abbott and Snidal, orchestration involves intergovernmental institutions enlisting nonstate and substate actors as intermediaries in pursuit of international goals (Abbott et al. 2015). TCG theorists have adapted this model to transnational governance by reconceptualizing orchestration as "a process whereby states or intergovernmental organizations initiate, guide, broaden, and strengthen transnational governance by non-state and/or sub-state actors" (Hale and Roger 2014, 60–61). Importantly, states and intergovernmental institutions—not transnational actors—orchestrate transnational governance.

Equipped with some version of this analytical framework, researchers have explored a range of emerging TCG initiatives: transnational municipal climate networks like C40 Cities (Hakelburg 2014), voluntary standards and certification schemes like the Gold Standard for carbon offsets (Blum and Lovbrand 2019), and "Johannesburg partnerships" emerging from the 2002 World Summit on Sustainable Development and similar hybrid initiatives (Bäckstrand and Kylsater 2014). Such research rests on the widely accepted view that "examining the sources of diversity and types of transnational governance within the climate regime can … provide us with a rich basis for analysis of the broader landscape

of transnational governance networks" (Andonova et al. 2009, 58). Those who have developed and refined the TCG framework envision it as applicable to all aspects of the climate change problem.

Solar Geoengineering

Solar geoengineering, also known as solar radiation management or SRM, would entail a technological intervention to reduce the amount of incoming sunlight in order to lessen some of the worst consequences of climate change (National Research Council 2015). The most frequently discussed form of solar geoengineering is known as stratospheric aerosol injection. It would involve dispersing aerosol particles, for example, sulfur, into the lower stratosphere, where they would reflect a small portion of incoming sunlight back to space, cooling temperatures globally and compensating for some, but not all, impacts of climate change. Aerosols would most likely be delivered via high-altitude jets. Because they would fall back to the Earth's surface after one or two years, these particles would need to be replenished periodically.

While the climatic effects of solar geoengineering would begin to manifest as soon as six months following deployment, implementation could not address all impacts of elevated concentrations of greenhouse gases (GHGs), for instance, ocean acidification. Moreover, implementation might result in significant changes to regional climates, including modified hydrological cycles. The direct cost of a deployment designed to reduce the rate of global warming by half has been estimated at as little as US$ 2.25 billion per year (Smith and Wagner 2018). These estimates are far below the likely costs of decarbonizing the world economy, creating the prospect that individual countries or coalitions might choose to "unilaterally" deploy the technology against the wishes of other states. The possibility of relatively inexpensive solar geoengineering also poses what is widely referred to as the moral hazard problem: the possibility that studying, deliberating about, and/or implementing solar geoengineering could weaken efforts to curb emissions (Lin 2013).[3]

Solar geoengineering was widely considered a taboo subject until the publication of an influential article by Nobel laureate Paul Crutzen in 2006, after which a loose network of academics and researchers took up the subject as a topic of debate and study and helped place it on the policy agenda (Kintisch 2010). Within the research community, the technology remains decidedly controversial. Among the broader public, people across the world are generally unaware of solar geoengineering (Cummings et al. 2017). Only a handful of states have taken explicit positions on the subject of solar geoengineering,

3. While the term *moral hazard* has been (rightly) criticized for not accurately capturing the nature of this problem, and other terms (such as *mitigation obstruction* and *risk compensation*) have been proposed as replacements, *moral hazard* remains the best-known and most widely used term to describe this phenomenon; thus, we use the term here for the sake of simplicity.

and funding for research, both public and private, has been very small relative to funding for conventional climate change research (Necheles et al. 2018).

Lack of state (and substate) engagement is attributable to a number of factors.[4] Public ignorance, scientific unease, and discomfort among environmentalists have given politicians and officials little cause to get involved. Significant scientific uncertainty has impeded bureaucratic efforts to reach consensus and define positions on the subject (Möller 2020). Relatively low estimated deployment costs mean limited commercial opportunities, which has deprived government officials of a key reason for engaging with this emerging technology (Marchant et al. 2009).

Given this incentive structure, states have largely stayed on the sidelines, and solar geoengineering has rarely been taken up in interstate forums. The most significant instance of multilateral decision-making occurred at the 2010 meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD), where states put in place a nonbinding, hortative moratorium on research and deployment activities with an exception for small-scale studies (Convention on Biological Diversity 2010). The substantive impact of this decision has been minimal, but it has had important framing effects on subsequent discussions.

Transnational Activity in Solar Geoengineering

Our goal in this section is to draw attention to significant activities that have been pursued by transnational (nonstate) actors in the field of solar geoengineering. We do not intend to map the field in a comprehensive way but rather to highlight a number of important functions performed by nonstate actors that contribute to transnational governance but are not captured by the TCG framework. We focus in particular on three functions performed by four nonstate entities currently active in solar geoengineering: knowledge dissemination by the Geoengineering Modeling Intercomparison Project (GeoMIP), scientific capacity building supported by the Solar Radiation Management Governance Initiative (SRMGI), and lobbying conducted by the Action Group on Erosion, Technology, and Concentration (better known as the ETC Group) and the Carnegie Climate Governance Initiative (C2G).[5]

4. Since substate actors have not been involved in the field thus far, the following discussion of transnational activity in solar geoengineering is in effect focused solely on nonstate actors.
5. There are two other notable engagements we do not cover here. First, in 2009 a group of academics from Oxford University published the so-called Oxford Principles on governance of geoengineering (Rayner et al. 2013). While the Oxford Principles have unquestionably been influential in policy debates about solar geoengineering and obviously derive from a nonstate actor, that actor—a group of British researchers—resides in one state and thus is not transnational according to the terms of the TCG framework (which specifies that transnational actors must be located in at least two states). Second, in 2015, international legal scholars published a code of conduct (subsequently revised) intended to guide researchers, funders, regulators, and other decision makers interested in pursuing small-scale, including outdoor, research (Hubert 2017). Workshops, meetings, and other efforts to encourage further development and use of

GeoMIP: Disseminating Knowledge

GeoMIP brings together nearly twenty climate modeling groups from institutions in Europe, North America, Asia, and Australia to run standardized solar geoengineering experiments. Beginning in 2011, participants in GeoMIP have thus far conducted three phases of computer simulations to explore the (modeled) effects and impacts of different deployment schemes. Simulating identical scenarios across different global climate models helps to increase confidence where results are similar (Kravitz et al. 2015). As GeoMIP describes its activities, "[W]e hope to gather model consensus as to the likely climate effects of geoengineering in order to better inform the scientific community, policy makers, and the public."[6]

GeoMIP is a research project aimed at increasing and disseminating scientific knowledge. The scientists who compose it constitute a classic epistemic community, or "network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area" (Haas 1992, 3). For TCG theorists, however, "epistemic communities are seen as gaining influence within international regimes," and their significance "is measured in terms of the extent to which they shape, facilitate, and change the behavior of nation-states within international regimes" (Betsill and Bulkeley 2004, 474–475). Sharing information in this way is not the same as steering: "it is critical to distinguish between the use of information … as a tool of organization and political leverage, and the use of information in governance networks as a means of governing" (Andonova et al. 2009, 63–64). GeoMIP is explicit about its deliberate avoidance of steering: "This project does not endorse or advocate either testing or actual implementation of geoengineering. It also does not attempt to dictate climate policy of any kind, a task which we feel is best left to governing entities."[7]

Clearly, GeoMIP makes no claim to govern, yet the research it spearheads is fundamentally driven by public policy goals, specifically, the desire to reduce climate change. The very purpose of the knowledge produced by GeoMIP is to inform policy deliberations over how to secure the common (planetary) good. Excluding such work from consideration because epistemic communities do not specifically aim to regulate behavior would seem to elide a form of transnational engagement likely to prove essential to future climate policy making and global governance.

SRMGI: Building Capacity

SRMGI, founded in 2010, is a partnership between the Royal Society, the World Academy of Sciences, and the Environmental Defense Fund. Until recently, SRMGI has been focused on convening stakeholder meetings in developing countries around the world to raise awareness about the technology and its

the code were subsequently organized under the auspices of the Geoengineering Research Governance Project—these activities clearly qualify as governing as conceived by TCG.

6. http://climate.envsci.rutgers.edu/GeoMIP/, last accessed July 3, 2020.
7. http://climate.envsci.rutgers.edu/GeoMIP/, last accessed July 3, 2020.

implications. To date, SRMGI has hosted twenty-five meetings, mostly in the Global South, bringing local researchers and representatives from civil society, governments, and regional organizations together with experts from leading universities and research institutes to learn about and consider solar geoengineering.

In 2018, SRMGI broadened its efforts by launching the Developing Country Impacts Modelling Analysis for SRM (DECIMALS) Fund to enhance climate modeling capabilities in the Global South. Eight teams from across the developing world were awarded grants that will total more than US$ 430,000 by 2020, supporting research into, for example, potential temperature and precipitation effects of solar geoengineering in Indonesia and possible impacts on infectious disease vectors in Bangladesh. The underlying aim of the DECIMALS Fund is to build developing country capacity to research and evaluate solar geoengineering.

SRMGI is principally concerned with empowering developing country engagement with solar geoengineering through scientific capacity building. For TCG, however, building capacity without promoting specific goals is out of its scope: "We consider capacity building and implementation to be more than a simple transmission belt of policies and practices from the global to the local level. … Such functions become a critical means through which governing—steering subjects and their actions—is accomplished" (Andonova et al. 2009, 64). As with GeoMIP, SRMGI is explicit in not seeking to guide behavior: "SRMGI is neutral on SRM and does not take a position on how any research should be governed or on whether SRM geoengineering should ever be used. Instead, we believe that broadening the international conversation, in particular by bringing in more voices from the Global South, will strengthen humanity's ability to handle the issue prudently and equitably."[8] Enabling and facilitating—not controlling—is central to the mission of SRMGI, and yet the TCG framework would seem to rule out inclusion of this self-described "governance initiative" as an element of transnational governance.

The ETC Group and C2G: Lobbying

The ETC Group is a Canadian NGO (now based in the Philippines) dedicated to opposing emerging technologies on sociopolitical grounds. Since the late 2000s, the ETC Group has been at the forefront of efforts to oppose solar geoengineering. It first rose to prominence in this context at the 2010 meeting of the CBD in Japan, where it was widely credited as the driving force behind the call for a moratorium on geoengineering activities (Sugiyama and Sugiyama 2010). In the years since, the ETC Group has been joined by other like-minded NGOs, such as Biofuelwatch and the Heinrich Boell Foundation, as persistent critics of geoengineering at additional meetings of the CBD and UNFCCC, where they hold side events and pressure member governments to oppose measures they regard as facilitating technological development.

8. https://www.srmgi.org/about/, last accessed July 3, 2020.

At the national level, the ETC Group turned its attention in 2011 to a proposed field test of a tethered balloon delivery system as part of the Stratospheric Particle Injection for Climate Engineering (SPICE) project funded by the UK government. Although the test would only have released water into the atmosphere, the ETC Group organized the Hands Off Mother Earth (HOME) campaign involving approximately 180 global civil society organizations to oppose it. Together, these groups sent a signed letter to the Department of Energy and Climate Change and those Research Councils supporting SPICE calling for its suspension.[9] The test was subsequently cancelled.[10] From the perspective of TCG theorists, the lobbying activities pursued by the ETC Group and its allies do not count as governance: "Transnational governance … is distinct from transnational advocacy because it does not aim to bring about a shift in governmental policies" (Andonova et al. 2017, 254).

More recently, C2G has undertaken to raise awareness of solar geoengineering among governments and intergovernmental institutions. Organized as an initiative of the Carnegie Council for Ethics in International Affairs in 2017, C2G is primarily concerned with enhancing familiarity with solar geoengineering within policy circles in order to better equip decision makers to deal with its anticipated governance challenges. Like GeoMIP and SRMGI, C2G refuses to take a position on the desirability of solar geoengineering: "C2G is impartial regarding the research, testing or potential use of any proposed technologies or interventions (these are choices for society to make)."[11]

Efforts by C2G have focused on lobbying at governmental and intergovernmental levels. In 2018, C2G worked with officials from multiple governments to facilitate Swiss submission of a draft resolution on "geoengineering and its governance" at a 2019 meeting of the UN Environment Assembly (UNEA) in Nairobi (UNEP 2018b). The draft called on UNEP to conduct technology assessments of solar geoengineering (as well as negative emissions technologies); it was agnostic as to whether these technologies should be pursued (Jinnah and Nicholson 2019). Prior to the start of the meeting, disagreements emerged among diplomats on a number of issues, resulting in deadlock that caused Switzerland to withdraw the draft. As this instance shows, activities on the part of C2G have affected the trajectory of early steps toward global governance of solar geoengineering, and yet they fall outside the scope of TCG: "lobbying and advocacy by interest groups at international climate negotiations do not constitute networked governance" (Bäckstrand 2008, 86).

The conception of governance as steering advocated by TCG theorists, then, appears to exclude a number of current transnational engagements in the field of solar geoengineering, including knowledge dissemination, capacity building, and lobbying. This would suggest that such conventional forms of

9. https://www.etcgroup.org/sites/www.etcgroup.org/files/publication/pdf_file/SPICE-Opposition%20Letter.pdf, last accessed June 30, 2020.
10. Although the ETC Group and HOME campaign took credit, project managers cited an intellectual property dispute as the basis for their decision (Cressey 2012).
11. https://www.c2g2.net/c2g2-mission/, last accessed July 3, 2020.

nonstate political participation should not factor into analyses of governance at local, national, international, or global levels. We reject this, and we suspect that many theorists of transnational governance would as well. Such a narrow view of governing conflicts with accepted definitions including, for example, that offered by Kooiman (2003, 4): "Governing can be considered as the totality of interactions, in which public as well as private actors participate, aimed at solving societal problems or creating societal opportunities; attending to the institutions as contexts for these governing interactions; and establishing a normative foundation for all those activities." A broader conception of (transnational) governance that accords with common usage and captures relevant behavior thus requires that the TCG framework be reconciled with other types of political engagement that figure prominently in other areas of social science research.

TCG and the Literature on Solar Geoengineering Research Governance

The literature on governance of solar geoengineering is generally divided into considerations of near-term research governance and theorizing about possible future schemes for governance of deployment (Reynolds 2019). Our focus is on the former. While solar geoengineering is frequently described as "ungoverned" in media accounts, few if any scholars studying research governance make this claim. Few of these scholars, however, have gone beyond noting that research on solar geoengineering is subject to *some* governance. We are aware of only two serious theoretical efforts to characterize the current state of solar geoengineering (research) governance.

First, Talberg et al. (2018, 248) "find that geoengineering is in a state of 'governance-by-default' … in which academics are acting to the full extent of their capacities, and potentially beyond, for lack of any barriers, within and beyond the research arena." Governance-by-default is defined in part by "an absence of purposive regulation" (Talberg et al. 2018, 248). Talberg et al. write that although "it can be argued that geoengineering governance-by-default does have an element of steering … it is difficult to argue that this steering has an end goal or clear purpose within the context of sustainable development" (Talberg et al. 2018, 249). Thus, in attempting to characterize the current solar geoengineering governance landscape as one in which academics are steering, Talberg et al. end up rejecting the key TCG conjecture that governance as steering must be purposive. In our view, the notion of governance without purpose makes little sense. Curiously, the authors fail to discuss GeoMIP, SRMGI, and the ETC Group, all of which are widely regarded as important players in the current governance landscape.

Second, taking a different approach, Gupta and Möller (2019, 481) argue that solar geoengineering is characterized by "de facto governance," understood as

> sources of governance that are *unacknowledged and unrecognized* as seeking to govern, even as they exercise governance effects. Understood as such, de facto governance is distinct from both formal, state-led, legally binding *de jure* forms

> of steering, as well as informal, non-state sources of steering, which share the characteristic of intentionally seeking to steer the behavior of certain actions or institutions, in order to realize specific, openly stated goals. (emphasis original)

Gupta and Möller locate the sources of such de facto governance in authoritative scientific assessments of solar geoengineering. Yet, similar to our point above, "de facto" or unintentional governance is an unstable concept insofar as governance is understood to be purposive; the phenomenon with which Gupta and Möller are concerned seems more akin to structuring that governance. Like Talberg et al., Gupta and Möller neglect to consider GeoMIP, SRMGI, the ETC Group, or C2G, although this is less an instance of oversight than a function of their downplayed emphasis on agency.

In both these instances, efforts to maintain a strict focus on steering as the exclusive mode of transnational governance as per the TCG framework ultimately result in conceptions of "governance" stripped of intentionality and bearing little resemblance to the term as commonly used. What is lost (arguably) are explanations that reflect the most significant transnational interventions in solar geoengineering governance. Perhaps not surprisingly, leading proposals for research governance (as distinct from efforts to characterize current arrangements) either do not draw on TCG or depart from it in significant ways. For example, in their proposal for "immediate polycentric governance," Nicholson et al. (2018) make no mention of the framework while downplaying the relative importance of transnational governance. In a separate proposal for an "Advisory Commission for SRM Research," Jinnah et al. (2018, 371) argue that "in the absence of clear political positions on SRM research from governments, sub-state actors can orchestrate participatory processes as a way to catalyze governance in this area." Although they ground their recommendation in the TCG and orchestration literature, in calling for substate orchestration, the authors disregard the specification by TCG theorists that orchestration is organized "by states and intergovernmental organizations" (Roger et al. 2017, 17). Finally, in their scheme for "nonstate governance of solar geoengineering research," Reynolds and Parson (2020) "use 'governance' to denote sustained, goal-oriented use of authority to influence behavior." Unfortunately, in eschewing reliance on TCG, such proposals neglect to take advantage of numerous valuable insights provided by the framework.

Toward an Integrated Theory of Transnational Governance

As our exploration of ongoing transnational governance activities in solar geoengineering demonstrates, an exclusive focus by the TCG framework on steering as opposed to influencing prevents it from accounting for numerous transnational engagements generally regarded as important parts of governance. Addressing this theoretical oversight requires looking to other analytical frameworks.[12]

12. Promotion of the Oxford Principles would be captured by the TCG framework simply by emphasizing the multistate nature of transnational activity rather than multistate residence of transnational actors.

The literature on epistemic communities, for instance, is focused on ways expert networks influence governments and other audiences on questions of transboundary public policy. In disseminating knowledge, networked professionals target more than governments: "it is clear that epistemic communities not only seek to persuade states, but also a wide variety of *non-state* actors. They are not only underpinning specific government policies, but also shaping *governance* more broadly" (Davis Cross 2013, 139, emphasis original).

This accurately describes GeoMIP, which seeks to provide policy makers and the broader public with baseline knowledge about the efficacy and risks of solar geoengineering. Common understandings of transnational governance take for granted that exercising authoritative influence on global policy debates is an important element: "Epistemic communities fit well into broader research on the phenomenon of transnational global governance. Non-state actors, whose influence often rests on shared knowledge, are involved in many aspects of transnational governance" (Davis Cross 2013, 140). A theory of transnational governance ought to account for information-sharing activities performed by epistemic communities that are intended to shape public policy.

Separately, an emerging literature on NGO lobbying is engaged in breaking down subdisciplinary barriers between studies of interest groups and studies of NGO advocacy. As contributors put it, "for too long, the study of NGOs in global governance has been divorced from the study of interest groups in American and European politics, given the conceptual and empirical parallels" (Tallberg et al. 2015, 235). The literature on interest groups has long considered ways in which lobbying affects public policy via mobilization and representation, particularly in the United States and, more recently, the European Union (Hojnacki et al. 2012). While much early interest group research viewed lobbying as promoting private rather than public interests, the field has come to regard some interest group activities as largely public in orientation. Separately, the literature on NGO advocacy has focused on the ways that nonstate, nonprofit entities promote specific principles and values by seeking to influence states and intergovernmental institutions (Risse 2002). NGOs may act individually, as members of issue-specific coalitions, or as nodes within more loosely organized networks. In essence, proponents of the new research on NGO lobbying apply models of interest group behavior developed in the Western democratic political context to advocacy group efforts to influence the intergovernmental sphere (Dellmuth and Bloodgood 2019).

From this perspective, NGOs are particularly active during the agenda-setting stage of the policy cycle, which corresponds to the current early research phase of solar geoengineering. NGO lobbying typically centers on raising awareness of particular issues within the policy community and framing those issues in ways that promote the values they care about. To make their case, NGOs employ inside and/or outside strategies: inside strategies involve direct engagements with policy makers within relevant organizations and institutions, while outside strategies involve seeking to mobilize public opinion, frequently through use of the media and in the form of campaigns (Dellmuth and Tallberg

2017). The ETC Group and C2G have deployed both strategies to help shape the agenda for solar geoengineering.

The ETC Group has mixed inside and outside strategies to oppose development of the technology. At conferences of the parties and other meetings of international conventions, including the CBD, the London Convention/London Protocol, the UNFCCC, the ETC Group, Biofuelwatch, the Heinrich Boell Foundation, and other NGOs have drawn attention to solar geoengineering framed largely in terms of the precautionary principle, specifically arguing that a precautionary approach rules out such a risky technology. By contrast, when the ETC Group organized the HOME campaign to stop the SPICE field test in the United Kingdom, it used the media (including sympathetic outlets like the *Guardian*) in an effort to pressure decision makers to cancel it. For its part, C2G has relied more exclusively on inside lobbying to get solar geoengineering on the agenda. This is well illustrated by its UNEA strategy, where C2G collaborated with Swiss and other governments to raise the issue formally by calling for a "neutral" technology assessment; this framing reflects the risk-management approach to geoengineering espoused by C2G.

In these instances, individual and collective NGO engagements clearly affected intergovernmental agenda-setting in ways that significantly shaped and informed incipient global governance of solar geoengineering. Andonova et al. (2009, n. 59) note, "We recognize that the line between influence and governance is a fine one, but nonetheless contend that such a line exists and that its delineation requires specifying the distinction." We agree but further contend that fixing the scope of analysis based on this subtle conceptual delineation does more harm than good if the overriding goal is to understand global governance. In a similar way, if one accepts that "NGOs' strategy options and choice motives in global governance are not intrinsically different from those of interest groups in domestic or European politics" (Dellmuth and Tallberg 2017, 808), the combination of an integrated theory of NGO lobbying and a TCG framework organized around transnational steering could be a powerful tool for advancing knowledge—and ultimately the practice—of global governance.

Key to bringing theories of NGO lobbying to bear on transnational governance will be shifting the conceptualization of the public–private distinction away from a binary and toward a continuum (Horwitz 1982). TCG tends to reify this dichotomy in a way that identifies interest groups with solely private, material interests ("special interests") as distinct from the public interest typically associated with governance. In reality, interest groups advocate for a wide array of interests and causes, only some of which pertain to profit or economic or political power. Viewing the interests promoted by such groups as lying somewhere along a spectrum from purely private to purely public will facilitate recognizing lobbying as a principal form of influence pursued in parallel with steering by nonstate actors engaged in transnational governance.

Accounting for influence would also permit the TCG framework to assimilate the sort of scientific capacity building performed by SRMGI. Theorists of

"capacity development for the environment" (CDE) have critiqued conventional notions of capacity assistance, technical cooperation, and technology transfer as

> focused mainly on capacity to implement international environmental agreements … and projects and to integrate environmental management in developmental activities. This often leads to a sectoral and technocratic approach that is also focused on implementation … and may ultimately hobble the long-term effectiveness of CDE efforts. (Sagar and VanDeveer 2005, 16)

A superior understanding of CDE goes beyond "implementation capacities" to "include more attention to research, assessment, and learning capacities" (Sagar and VanDeveer 2005, 16–17). Facilitating participation in the policy process through outreach, education, and collaboration is surely an element of governance broadly conceived. CDE theorists' work to incorporate "upstream" scientific capacity building within a more expansive concept of capacity development contains lessons applicable to the TCG framework.

Luckily, TCG theorists have a record of integrating external insights and conceptual models into their analytical framework, as demonstrated by their previous incorporation of the theory of orchestration. New synthetic research on interest groups and NGO advocacy could be similarly accommodated. Other modifications, such as a widened understanding of epistemic community governance activity and a broadened conception of capacity building, should be relatively straightforward. A resulting, broader theory of transnational governance applicable to direct steering *and* indirect influence would expand on the success TCG has enjoyed thus far, with potential applicability well beyond climate policy.

Conclusions

Climate change poses extremely complex governance challenges in part because its successful management will require contributions from developed and developing countries, intergovernmental institutions, epistemic communities, NGOs, firms, and citizens. Similarly, while solar geoengineering may be capable of significantly reducing climate risks, if this technology is ever used, it must be coupled with ambitious efforts to curb GHG emissions, adapt to climate impacts, and remove carbon from the atmosphere. These linkages underscore the vast number and various types of actors whose participation will be necessary for effective governance.

Likewise, scholars invested in climate governance must leverage knowledge from *all* applicable analytical frameworks. Although TCG has been successful in bringing attention to a variety of innovative transnational climate initiatives, to be complete, a theory of transnational governance must incorporate both "new" and "old" forms of public cross-border engagement by nonstate and substate actors. Fortunately, other literatures offer accounts of

transnational influence that complement the TCG focus on steering as governance. Epistemic communities disseminate causal and normative knowledge to states and nonstate actors engaged in the policy process. NGOs advocate for their positions by lobbying governments and relevant publics. And capacity building applies to more than just implementation. In these cases, rather than acting directly on target actors by means of steering, transnational actors seek to influence states and other entities indirectly to bring about desired outcomes. Viewing the various analytical frameworks as complementary is key to capturing the gamut of important functions performed by nonstate and substate actors in climate governance.

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